2. Requirement, project, functionality

2.1 Introduction

2.1.1 Target

This document describes the implementation of the sch413 Team Icefield specification (a precise and complete description of the requirements and functionality), the project schedule and related information.

2.1.2 Specialist area

The software is a game program that was developed as a requirement of the Software Project Laboratory (BMEVIIIAB02). Its purpose is to complete the course and make the consultants' days just a tiny bit better.

2.1.3 Definitions, abbreviations

2.1.4 References

shutterstock.com
Materials for the 3rd semester Software Engineering

2.1.5 Summary

The rest of the document describes the project in more detail in different aspects, such as: the features of the program, the prerequisites for use, both in terms of user knowledge and system requirements, or the requirements and use-case descriptions.

2.2 Overview

2.2.1 General overview

The main part of the programme is occupied by the game board, which contains an arrangement of ice blocks. You can also find an information window here, which describes what you can know about a particular ice sheet or player. The user can use the mouse and keyboard to control the actions of characters and retrieve information about a particular ice sheet.

2.2.2 Functions

The game has two types of players, Eskimos and Arctic explorers. Eskimos start the game with 5 lives, Arctic explorers with 4. Neither player can exceed this during the game . There can be 3-10 players per game (to keep the game enjoyable, but in principle it could be any number). Players move in rounds. Each player is given a number, the players take turns according to this number, which remains their number until the end of the game. A player's turn ends when he has spent all his action points or no longer wishes to act.

The ice field:

The ice field is made up of polygonal ice shelves. Two fields are adjacent if they have sides in common. There are stable and unstable ice sheets; stable ice sheets can have any number of people on them at the same time, while unstable ice sheets can have only a limited number of

2020-02-21

people on them. All ice tiles on which the players are standing at the start of the game are stable. If there are more players on the ice board than there can be, all the players on the board will fall into the water. This value varies per ice board, the value of an ice board does not change during the game.

The ice sheets are covered with snow, layers 0-5, where 0 indicates a snow-free field. All players can see how much snow is on which field. There can also be a hole on an ice sheet, which if a player steps on it, the player's turn ends immediately. The hole is not visible if the field has at least 1 layer of snow.

A maximum of 1 object can be frozen in a block of ice. These can be: shovel, rope, wetsuit, food, gun, flare, cartridge. Pistol, flare, cartridge (key items): exactly one of each item can be found on the ice field. No objects are allowed on ice slabs with holes. Objects can be seen if there is 0 layer of snow on the ice sheet. These objects can be dug out under certain conditions.

The course of a round:

Each player can do 4 units of work in a round. One of the following actions can be performed for 1 action point:
- snow clearance
- movement to an adjacent ice sheet
- digging up an object
- rescue teammates
- iglu construction
- soil research
- Assembling the flare
- eating food

Snow clearing: any operator can clear snow. Any player can clear snow from the field on which that player is standing. Only the player who is standing on the player's position can clear 1 layer of snow.

Digging up an object: an object in a field may be dug up by the player standing on that field if there is no snow or igloos on that field. In this case, the object is placed in the bag of that player. A character may carry any number of objects, even several identical ones.

Rescuing teammates: players with a rope can rescue a teammate who has fallen into the water in the adjacent field if they have a rope. In this case, the drowned player will be moved to the rescuer's field.

Building an igloo: Eskimos can build an igloo on the ice slabs if there is at least 1 layer of snow on the slabs, after building the igloo all snow will disappear from the field. The igloo remains on the ice until it is removed or the game ends. An Igloo can only be built by an Eskimo on the field it is standing on.

Soil exploration: a polar explorer can map the field he is standing on, or any adjacent field. This will reveal how many players the field being examined can support and whether it has any holes.

Eating food: Any character with food in their bag may eat one, increasing their life points by one.

Assembling the flare: it is possible when all the players are standing on the same field and have found all 3 key pieces. At this point the game ends.

At the end of each round there are 2 options, either a blizzard comes or it doesn't. If it does, then any player not on a field with igloos on it loses 1 life point.Each field has a percentage chance of one or more layers of snow falling, in no case more than 5 snow on any one field.

2020-02-21

If there has been a snowstorm, a counter is started from a randomly drawn positive integer value. This is decremented by 1 at the end of each round. If this value reaches 0, there is a blizzard and the counter restarts as described above. This value is known to the players. There can be a maximum of 1 blizzard per round.

Death of a character: a character can die in one of three ways
-   loses his last life point in a blizzard
-   fell into a hole and nobody pulled him out until the beginning of his next round, and he had no wetsuit
-   fell into the water while standing on an unstable ice floe, and the actor who stepped on it exceeded the ice floe's load-bearing capacity. In this case, the player dies when all the players on land have already made at least one move, i.e. all of them have had a chance to rescue him.

Whichever way a character dies, the game ends immediately.

2.2.3 Users

There are no special requirements to use the programme, anyone can use it.

2.2.4 Restrictions

The program should be intuitive to use, so that you don't need a lot of computer or other skills to play. In addition, the game should run at a playable speed, so the user should not have to wait an unreasonable amount of time for the program to run.

2.2.5 Assumptions, links

Websites:
shuttersock.com - images for a small part of the program's graphical interface (more precisely: objects) were taken from here, to make the program user-friendly.

2.3 Requirements

2.3.1 Functional requirements

Identifier	Description	Check	Priority	Source from	Use-case
FR01	The game can be played by 3 or more players	presentation	basic	terms of reference	Completion of the round
FR02	The game takes place on an ice field surrounded by sea	presentation	basic	terms of reference	View the track
FR03	The ice field consists of smaller units (ice sheets and holes)	presentation	basic	terms of reference	View the track
FR04	Two types of characters can be controlled: an Eskimo and an Arctic explorer	presentation	basic	terms of reference	Character movement
FR05	Player activities are divided into rounds	presentation, evaluation	basic	terms of reference	Completion of the round
FR06	Eskimos have 5, Arctic explorers have 4 units of body heat (life) at the beginning of the game (you can never have more)	presentation, evaluation	basic	terms of reference	Food consumption
FR07	Ice sheets can be stable or unstable	presentation	basic	terms of reference	Character movement
FR08	Any number of people can stand on a stable ice sheet	presentation, evaluation	basic	terms of reference	Character movement
FR09	An unstable ice sheet cannot support more than a given number of players	presentation, evaluation	basic	terms of reference	Character movement
FR10	If an unstable ice floe has more than its capacity, it will break and the people standing on it will fall into the water	presentation, evaluation	basic	terms of reference	Character movement
FR11	Holes can't hold a single actor	presentation	basic	terms of reference	Character movement
FR12	Stepping into a hole, the character falls straight into the water	presentation, evaluation	basic	terms of reference	Character movement
FR13	The ice slabs and holes have a layer of snow of different thicknesses at the beginning of the game	presentation	basic	terms of reference	View the track
FR14	Various objects can be buried in the ice slabs: paddle, rope, wetsuit, food, gun, flare, cartridge	presentation	basic	terms of reference	Excavation of the object
FR15	If there is snow or igloo on the ice slab of a buried asset, it cannot be seen	presentation	basic	terms of reference	Excavation of the object
FR16	Buried tools can be dug up and then placed in the digger's bag	presentation	basic	terms of reference	Excavation of the object
FR17	To build a flare, you need to dig out the gun, flare and cartridge, then carry it to a field	presentation	basic	terms of reference	Marker rocket assembly

2020-02-21

FR18	Storm may break out on the island at random intervals between rounds	presentation	basic	job description + team	Generating a snowstorm
FR19	The time of the next storm is indicated to the players (how many rounds until the next storm)	presentation	optional	team	Generating a snowstorm
FR20	The storm covered some ice sheets with another layer of snow	presentation	basic	terms of reference	Generating a snowstorm
FR21	The storm can also hit characters, who will have their body (life) reduced by 1.	presentation, evaluation	basic	terms of reference	Generating a snowstorm
FR22	Igloo field operators are protected from the storm	presentation, evaluation	basic	terms of reference	Igloo construction
FR23	Igloos can be built on a field with at least 1 layer of snow	presentation	important	team	Igloo construction
FR24	The actors can carry out different activities	presentation	basic	terms of reference	How to do the job
FR25	An actor can do 4 units of work in a round	presentation	basic	terms of reference	Completion of the round
FR26	It counts as one unit of work: - Snow clearance - Move to an adjacent ice sheet - Excavation of the object - Rescuing teammates - Igloo construction - Soil research - Assembling the beacon rocket - Eating food	presentation, evaluation	important	job description + team	How to do the job
FR27	- You can move from a given ice sheet only to an ice sheet with a common side for one unit of work, one at a time	presentation	basic	terms of reference	Character movement
FR28	Standing on a sheet of ice, you can clear the snow from it	presentation, evaluation	basic	terms of reference	Snow clearance
FR29	For one unit of work, you can clear one layer of snow with your bare hands, two with a shovel	presentation, evaluation	important	job description + team	Snow clearance
FR30	Eskimos can build igloos, and polar explorers can learn about the capacity of the ice they occupy and the ice next door	presentation	basic	terms of reference	Igloo construction, Soil research
FR31	The actor's body heat increases by eating unearthed food	presentation, evaluation	important	terms of reference	Food consumption
FR32	A group of drowned actors will die if they are not pulled out (with a rope) until the next turn of the actor who steps onto the ice floe, or if they do not have a wetsuit	presentation, evaluation	basic	team	Character **movement**

FR33	Diving suit operator doesn't die in the water, but can only get out if someone pulls him out	presentation	important	job description + team	Character **movement**
FR34	Everyone knows the capacity of the unstable ice sheets already detected	presentation	important	team	Soil research
FR35	The game ends when the beacon is built, at which point the players win	presentation	basic	terms of reference	Beacon rocket assembly
FR36	When a character runs out of body heat, he dies	presentation, evaluation	basic	terms of reference	Generating a snowstorm
FR37	The game is over if any of the players die	presentation	basic	terms of reference	Generate blizzard, Move character
FR38	The game shows an information window next to the ice field	presentation	optional	team	View the track
FR39	The information window tells you what you need to know about the ice sheet or the actor on the circle	presentation	optional	team	View the track

2.3.2 Resource requirements

Identifier	Description	Check	Priority	Source from
RR01	Write the program in Java	presentation, delivery	basic	terms of reference
RR02	The material to be uploaded will be packed in a single zip file	Delivery to	basic	terms of reference
RR03	The source program should be compiled and executable under the JDK used in the laboratory	presentation, delivery	basic	terms of reference
RR04	The program will be developed for devices running Windows 10, so it will be optimal to use	presentation	optional	team
RR05	The program will expect input from the keyboard or mouse	presentation	important	team

2.3.3 Delivery requirements

Identifier	Description	Check	Priority	Source from
DR01	All the basic requirements described above must be met	presentation, evaluation	basic	terms of reference + consultation + team
DR02	At least one member of the team assists the tester in the live demonstration of the programme	presentation	important	terms of reference + consultation + team
DR03	The program can be run with Java Runtime Environment 8	presentation	basic	terms of reference + consultation + team

2020-02-21

2.3.4 Other non-functional requirements

Identifier	Description	Check	Priority	Source from
NR01	Exhaustive, detailed testing	evaluation	basic	team + job description

2.4 Essential use-cases

2.4.1 Use-case descriptions

Use-case name	View the track
Short description	Players can view a map drawn by the controller, bounded by a sea (finite), consisting of several fields with different attributes, and their own and other players' characters on it.
Actors	Player
Script	**1** The system plots the current status of the track. **2** The player looks at the current state of the field and the properties of the field and his character.
Alternative scenario	**2.A** The field is covered with snow, the player can see this and also how many layers are covered. **2.B** The field is covered with ice. The player can see whether or not there is a hole and whether or not there is an object frozen in it.

Use-case name	Character movement
Short description	The player's character moves to a field adjacent to his own field (on which he is standing).
Actors	Player
Script	**1** The player selects the field where he wants to move his character. The player can move an Eskimo or an Arctic explorer.
Alternative scenario	**1.A.1** If the selected field is not adjacent to the target field, the player receives an error and has to select a new field.
	2 The character is already on the desired field (which is stable or unstable without exceeding its capacity).
Alternative scenario	**2.A.1** The selected field had a hole, the character fell into the water.
Alternative scenario	**2.B.1** The selected field was unstable, and with the newly entered character the field was already over its capacity, so it flipped over and all the characters on it fell into the water. **2.B.2** If the character is not rescued within the time limit or is not wearing a wetsuit, the game ends.
	3 The character's action points are reduced by 1.

Use-case name	Completion of the round
Short description	The player, having done everything he wanted and had the opportunity to do with the character, finishes his turn and hands over control of the game to the next character.
Actors	Player

2020-02-21

Script	1 The character is on the line.
Alternative scenario	**1.A.1 If the** character has run out of all 4 working points, his turn ends automatically. **1.B.1** The player decides that he no longer wishes to act with the character, but has the opportunity to do so (he still has a working point). He then passes.
	2. The next character starts their turn.
Alternative scenario	**2.A.1** If there is no next player, the round is over. A round consists of at least 3 rounds. **2.A.2** End-of-round events may occur (e.g.: snowstorm) **2.A.3** The first character follows.

*Note 1: The following use-case scenarios will not be used as an alternative case: the player has run out of action points, the action cannot be performed. Because if a player runs out of action points, his turn **automatically** ends.*

Use-case name	**Excavation of the object**
Short description	The character successfully stands in a field where he knows that an object is frozen in ice, digging it up for a working point.
Actors	Player
Script	**1** The character is standing on an uncovered field with an object frozen in it. The object can be: shovel, rope, wetsuit, food, gun, flare, cartridge.
Alternative scenario	**1.A.1** If the player has previously seen an object frozen in a given field, but it has since been covered by snow due to a snowstorm, he will not be able to dig it out, it will not be visible. **1.B.1** If an igloo is built on the field, the object cannot be excavated.
	2 In exchange for 1 action point, the character digs up the object.
	3 The item is placed in the character's toolbox/bag, which can no longer be picked up by anyone else.

Use-case name	**Igloo construction**
Short description	The Eskimo stands in a field covered with at least 1 layer of snow and builds an igloo on top of it.
Actors	Player
Script	**1** The player plays with an Eskimo character. **2** Your character is standing on a field covered with at least 1 layer of snow. **3** On this field he may build an igloo, in which there may be as many as there are in the field. **4** Players on the field are automatically included in the igloo, including the Eskimo after construction.
Alternative scenario	**4.A.1** Blizzard breaks out, players in igloo do not take body heat

Use-case name	**Food consumption**

Short description	The character eats the food in his possession, so his body heat increases.
Actors	Player
Script	**1**. The character eats the food in his possession.
Alternative scenario	**1.A.1** If the character's body heat is at maximum (5 units for Eskimos and 4 units for Arctic explorers), it remains at the maximum value and does not increase.
Alternative scenario	**1.B.1** If the character does not have maximum body heat, it increases by 1 unit during consumption.

Use-case name	**Soil research**
Short description	A polar explorer character explores the load capacity of its own or a neighbouring field.
Actors	Player
Script	**1.** The player plays with a polar explorer character. **2.** The character selects the field (own or adjacent) to be checked. **3.** The field shows how many characters it can hold or whether there is a hole in the field.

Use-case name	**Snow clearance**
Short description	The character removes one or more layers of snow on the field he is standing on.
Actors	Player
Script	**1**. There is snow on the field where the character is standing.
Alternative scenario	**1.A.1.** If the character does not have a shovel, 1 layer of snow disappears
Alternative scenario	**1.B.1.1.1** If the character has a shovel and there are 2 or more layers of snow on the field, 2 layers of snow disappear. **1.B.1.2** If the character has a shovel and there is 1 layer of snow on the field, 1 layer of snow disappears.
	2. If there is no snow in the field, nothing changes.

| Use-case name	**How to do the job**
Short description	The character performs an action in exchange for 1 action point.
Actors	Player
Script	**1**. The character does the work. **2.** If the action was successful, the character uses up 1 action point.

Use-case name	**Generating a snowstorm**
Short description	Randomly, a snowstorm breaks out at the end of some laps.
Actors	Controller
Script	**1.** A blizzard breaks out.

2020-02-21

	2. Characters not in igloo at the end of the round have their body heat reduced by 1
Alternative scenario	**2.A.1** If a character's body heat drops to 0, that character dies, the game ends.
	3. The storm covers some randomly chosen free ice sheets with another layer of snow.
	4. It's time for the next snowstorm.

Use-case name	Rescue a teammate
Short description	A character with a rope in the adjacent field is drowned.
Actors	Player
Script	**1**. The character with the rope selects the adjacent field from which to pull his/her drowned companion. **2.** The character chooses which of his/her partners to save from the given field. **3**. The rescued companion moves to the field of the character with the rope.

Use-case name	Beacon rocket assembly
Short description	Picking up all the pieces of the flare, the characters assemble it.
Actors	Player
Script	**1.** Find all the pieces of the flare and dig them out, and the characters will gather in one field. **2.** The next character in line can assemble the rocket. **3**. The player wins the game.

2.4.2 Use-case diagram
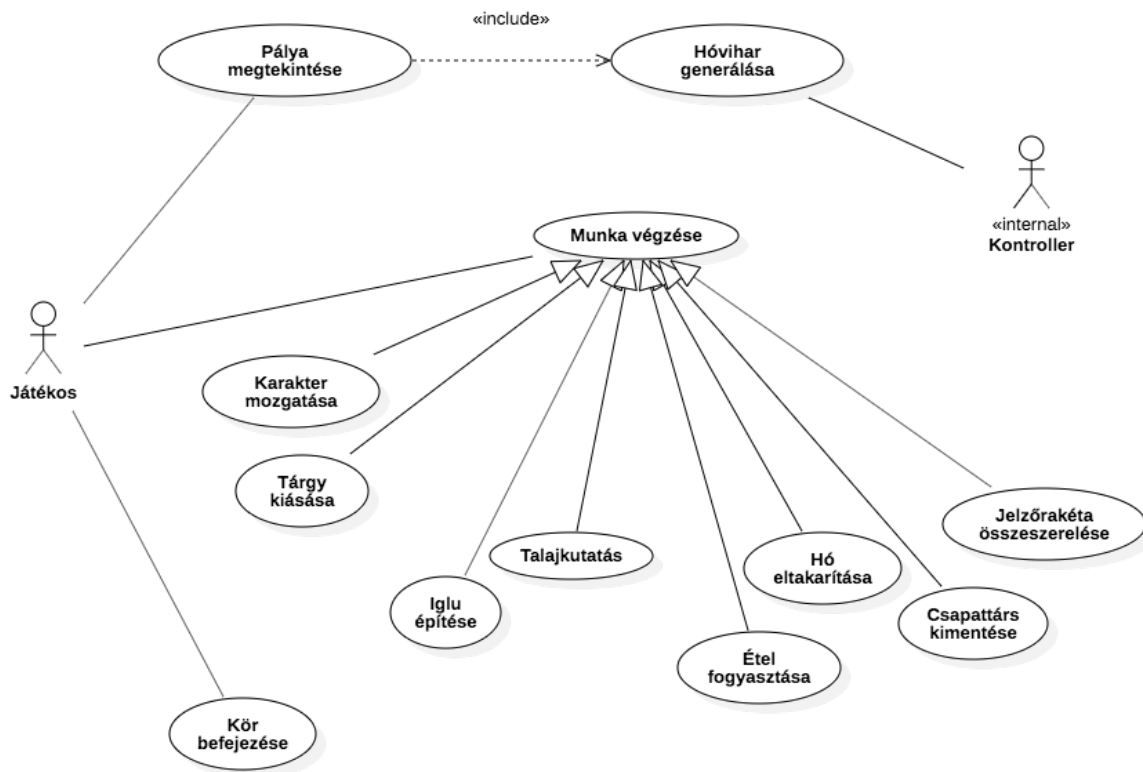
2.5 Dictionary

Action 2: Activities that can be carried out by operators.

action point: the number of **action points determines the** amount of work that can be done in a round.

frozen: see buried

fall in: if a character steps on and into a hole, they fall in. If it smashes under a block of ice, the same happens. The player can then die as described in the features.

Wearing a wetsuit: if a character has dug up a wetsuit, they are wearing a wetsuit.

rescue teammates: action, see. Use-case descriptions.

life: see body heat

life points: see body heat

buried: an object may be frozen in a block of ice. If there is no snow on the ice slab, the frozen object is visible, and the player can get it by digging it up.

Eskimo: A character type with specific characteristics as described in the requirements.

eating food: work where the food disappears from the player's bag, increasing his body heat.

round: a round is a series of single rounds of all players.

receives an error: an error message appears on the screen.

snow: an element of the game that can cover the ice field in several layers.

snow removal: removing snow from the ice sheet.

blizzard: game mechanics element, see. Use-case descriptions.

iglu: Eskimos can build on slabs of ice. If a character is in a field with igloos on it during a blizzard, they do not lose body heat.

iglu construction: action, see. Use-case descriptions.

information window: a graphic element on the screen that displays information.

ice capacity: the number of players the field can support without crumbling underneath.

ice field: the area on which players move, part of the program window.

ice sheet: see field

assembling a flare: an action that can be performed when all the players are on the same field and have found all 3 key items. At this point, the game ends.

Characters: the characters on the ice field controlled by the user.

digging out: when a character digs out an object from the ice sheet, it goes into his bag.

you draw something: Displays something on the screen.

round: a series of actions by a player, during which he can manage 4 action points.

key item: the items that must be assembled to win the game.

visibility: information such as the thickness of the snow layer is visible when it is displayed on the screen.

move: a player steps on a field when moving from one field to another.

hole: see water

field: the ice field is made up of these. It may be empty, or it may have one or more layers of snow, or important objects buried in it. It has a load-bearing capacity, which determines the number of characters that can be on it at one time. If more than this number of people step on it, the ice slab will break and the people standing on it will fall into the water. Actors can interact with it: step on it, check its load capacity, dig an object out of it, build an igloo on it, shovel snow off it. The zero load ice slab is a hole in the game board, and everyone who steps on it immediately falls into the water. The hole looks different from a normal ice board, but you can only see it when there is no snow on it. If there is no snow on an ice board, and it is not a hole, you can see if there is an object buried in it, and if so, what it is.

work: see action

polar explorer: a character type with specific characteristics as described in the requirements.

actors: see characters

soil research: action, see. Use-case descriptions.

Object: can be a shovel, rope, wetsuit, food, gun, flare, cartridge, gun, flare, and cartridge, which the actors can interact with.

Bag: Each character has a bag in which the objects they dig up are placed. Each character has a bag containing the objects that he/she will take with him/her.

Body Heat: A counter, if reduced to zero when the character dies, can no longer be used during the game.

water: A field with zero players.

2.6 Project plan

Week	Deadline	Posted on	Responsible
1	02.16.	24 h - registration of teams	*Csaba Juhász*
2	02.24.	Requirement, project, functionality - submission Neither the description nor the dictionary may contain computer and information technology words and expressions.	*Balázs Hain*
3	03.02.	Developing an analysis model 1. - submission	*Tamás Lukács*
4	03.09.	Developing an analytical model 2 - submission	*Bernát Ágó*
5	03.16.	Skeleton design - submission	*Márton Bankó*
6	03.23.	Skeleton - input and upload source code to hercules	*Csaba Juhász*

2020-02-21

		At least 20% of the source lines must be commentary.	
7	03.30.	Prototype concept - submission	*Balázs Hain*
8	04.06	Detailed plans - submission	*Tamás Lukács*
9	04.20.	Prototyping, testing	*Bernát Ágó*
10	04.27.	Prototype - submit and upload source code, test inputs and expected outputs to hercules At least 20% of the source lines must be commentary. All classes, methods and attributes must be preceded by a javadoc style comment.	*Márton Bankó*
11	05.04.	Graphical interface specification - submission	*Csaba Juhász*
12	05.11.	Create a graphic version	*Balázs Hain*
13	05.18.	Graphical version and Summary - submission and upload of source code to hercules At least 20% of the source lines must be commentary. All classes, methods and attributes must be preceded by a javadoc style comment. Also to be uploaded: An updated, merged version (either doc/docx or pdf format) of all documents submitted in hard copy (including the Summary chapter). The latter merged material MUST NOT BE ATTACHED !	*Tamás Lukács*

Project design, development process:

2020-02-21

At the beginning of the week, the team holds a meeting to work through the week's tasks together, work out the key points of the tasks together so that everyone is on the same page, and finally divide up the main parts among the members.
 The project is managed online, where the subtasks are first posted on a Kanban Board and assigned to the person responsible for that part. This allows the whole team to keep track of the project and its progress. When someone completes an assigned task, at least one other member of the team checks it and overrides it if necessary, but key issues are always decided by the whole team.
 Finally, at the end of the week, in an online meeting, the team discusses the progress made in that iteration, reviews the project as a whole for the last time, evaluates the work of the members and prepares a logbook.

Used tools, techniques:

UML diagrams: StarUML

Documentation: google docs

Code management: Github

Project management: Github Issues (kanban board)

Development tool: eclipse/IntelliJ

Graphic elements: Adobe Photoshop, Adobe Illustrator

Meeting: Monday or Tuesday in person - assigning tasks, Saturday evening on Discord - finalising the week's work

Checking: everyone's work is checked by a team member independent of the task

2.7 Diary

Start at	Duration	Participants	Description
2020.02.17 12:00	1 hour	Ágó, Bankó, Hain, Juhász, Lukács	Joint meeting in person. Topic: allocation of tasks, development decisions
2020.02.17 20:00	2 hours	Digging	Introduction. Overview
2020.02.18 22:00	1 hour	Digging	Introduction. Overview
2020.02.19	30 min	Juhász	Assignment + Study of Bernat's writings, brainstorming
2020.02.20	2.5 hours	Juhász	Writing requirements

2020-02-21

2020.02.20	3 hours	Lukács	Dictionary, Project plan
2020.02.22. 14:00	3 hours	Retrieved from	Use-Case descriptions (1-20), diagram sketch preparation
2020.02.22. 15:00	3 hours	Banker	Use-case diagram and descriptions (21-40)
2020.02.22 19:00	1 hour	Ágó, Bankó, Hain, Juhász, Lukács	Discord meeting Topic: documentation, process control

2020-02-21